

NON-PUBLIC?: N
ACCESSION #: 9110180122
LICENSEE EVENT REPORT (LER)

FACILITY NAME: Palo Verde Unit 1 PAGE: 1 OF 07

DOCKET NUMBER: 05000528

TITLE: Reactor Trip and ESF Actuation Due To Number 1 Steam Generator
High Level
EVENT DATE: 09/14/91 LER #: 91-009-00 REPORT DATE: 10/14/91

OTHER FACILITIES INVOLVED: N/A DOCKET NO: 05000

OPERATING MODE: 1 POWER LEVEL: 55

THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR
SECTION:
50.73(a)(2)(iv)

LICENSEE CONTACT FOR THIS LER:
NAME: D. A. Johnson, Compliance Supervisor TELEPHONE: (602) 393-3703

COMPONENT FAILURE DESCRIPTION:
CAUSE: X SYSTEM: SJ COMPONENT: FCV MANUFACTURER: F130
X AA TMR E146
REPORTABLE NPRDS: Y
N

SUPPLEMENTAL REPORT EXPECTED: NO

ABSTRACT:

On September 14, 1991, at approximately 1722 MST, Palo Verde Unit 1 was in Mode 1 (POWER OPERATION) at approximately 55 percent power when a reactor trip and a Main Steam Isolation Signal (MSIS) Engineered Safety Features actuation occurred due to high steam generator level. Prior to the reactor trip and MSIS, reactor power had been reduced as a result of a Part-Length Control Element Assembly slipping part way into the core during monthly testing. This power reduction was required by Technical Specifications. There were no other safety system responses required. The reactor trip was diagnosed as an uncomplicated reactor trip. The plant was stabilized in Mode 3 (HOT STANDBY).

The reactor trip and MSIS on high steam generator level was due to the number 1 steam generator economizer valve failing open which resulted in

overfeeding the steam generator. The economizer valve failure was due to a failure of the economizer valve positioner.

Troubleshooting was performed, the ability to withdraw the part-length CEA was restored, the economizer valve positioner replaced and tested, and both were returned to service.

There have been no previous similar events reported pursuant to 10CFR50.73.

END OF ABSTRACT

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I. DESCRIPTION OF WHAT OCCURRED:

A. Initial Conditions:

On September 14, 1991, at 1722 MST, Palo Verde Unit 1 was in Mode 1 (POWER OPERATION) at approximately 55 percent power.

B. Reportable Event Description (Including Dates and Approximate Times of Major Occurrences):

Event Classification: Any event or condition that resulted in the automatic actuation of the Reactor Protection System (RPS)(JC), and the automatic actuation of an Engineered Safety Feature (ESF)(JE).

On September 14, 1991, at approximately 1722 MST, Palo Verde Unit 1 experienced an automatic reactor (RCT)(AC) trip and Main Steam (SB) Isolation Signal (MSIS) Engineered Safety Feature Actuation (ESF)(JE) due to high steam generator level on number 1 steam generator (AB). Immediately prior to the reactor trip, the number 1 steam generator economizer valve (FCV)(SJ) failed full open. Following the trip, the plant was stabilized in Mode 3 (HOT STANDBY) at normal operating temperature and pressure. The trip was diagnosed as an uncomplicated reactor trip. No other safety system responses occurred and none were required.

Prior to the event, on September 14, 1991, Palo Verde Unit 1 was operating at 100 percent power. In accordance with approved work documents, monthly surveillance testing (CEA Operability Checks) was being performed on the Control Element

Assemblies (CEA)(AA). At approximately 1501 MST, a part length CEA slipped into the core (RCT)(AC) from approximately 145 inches to 95 inches. A power reduction from 100 percent to 80 percent was commenced to comply with Technical Specification (TS) Limiting Condition For Operation (LCO) ACTION 3.1.3.1.c, "Movable Control Assemblies," and attempts were made to retrieve the CEA. Technical Specification LCO ACTION 3.1.3.1.c allows continued Mode 1 operation if core power is reduced, shutdown margin requirements are satisfied, and the CEAs are aligned to within 6.6 inches while maintaining the allowable CEA sequence and insertion limits and thermal power level restrictions. The attempts to recover the misaligned CEA were unsuccessful and Operations personnel (utility, licensed) began to insert the other part-length CEAs in order to align the group with the slipped CEA. This would require that the part-length CEAs be inserted beyond the transient insertion limit of 112.5 inches required by T.S. LCO 3.1.3.7, "Part-Length CEA Insertion Limits".

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In accordance with T.S. LCO ACTION 3.1.3.1.c, the power reduction was continued to reduce reactor power to less than 50 percent. Troubleshooting by Instrument and Control (I&C) personnel (utility nonlicensed), which was in progress during the power reduction, determined that a malfunction of a timer card (TMR) (AA) that controlled the operation of the lower gripper (ROD)(AA) of the part-length CEA had occurred.

During the power reduction to less than 50 percent, the number 1 steam generator economizer valve failed full open. This caused the water level in the number 1 steam generator to rapidly increase. The secondary plant operator (utility, licensed) took manual control of the economizer valve controller (FCO) (JB) and attempted to close the valve. The economizer valve remained fully open. The Control Room Supervisor (CRS) (utility, licensed) directed that the reactor be tripped manually. An automatic reactor trip signal and a MSIS were received due to high steam generator level before a manual trip could be initiated.

At approximately 1730 MST, a Notification of Unusual Event (NUE) was declared in accordance with the Emergency Plan Implementing Procedures. The NUE was conservatively declared due to the power reduction required by Technical Specifications (TS), the reactor trip, the MSIS actuation, and radiation

monitor alarms which occurred as a result of increased activity in the reactor coolant from the gas gap release, the crud burst associated with the trip, and increased chemistry sampling. Appropriate local and state authorities and the NRC operations center were notified.

At approximately 1735 MST, the plant was stabilized in Mode 3. Because of the MSIS actuation, main turbine gland seal steam (TC) (SB) was lost, due to the loss of auxiliary steam (SA) which was lost as a result of the MSIS and operations personnel (utility, licensed and nonlicensed) breaking vacuum in the main condenser (SG). The main steam safety valves (RV)(SB) lifted briefly and the atmospheric dump valves (ADV)(SB) were used for heat removal. Steam generator levels were maintained using the Auxiliary Feedwater System (BA).

At approximately 0401 MST, on September 15, 1991, after chemistry samples confirmed that the radiation monitoring alarms were the expected result for the existing plant condition at the time of the trip, the NUE was terminated in accordance with approved procedures and the appropriate local and state agencies and the NRC Operations Center were notified.

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C. Status of structures, systems, or components that were inoperable at the start of the event that contributed to the event:

Not applicable - no structures, systems, or components were inoperable at the start of the event which contributed to this event.

D. Cause of each component or system failure, if known:

The part-length CEA slipped due to a malfunction of the CEA timer board. The CEA timer board malfunction was attributed to the failure of a chip on the CEA timer board. Failures of this type are tracked in accordance with the PVNGS Failure Data Tracking System.

The number 1 steam generator economizer valve opened due to a malfunction of the valve positioner. In accordance with the PVNGS Incident Investigation Program, a root cause of failure analysis was performed by APS Engineering Personnel. Analysis

of the failed valve positioner has indicated that o-rings in one of the positioner pneumatic relays failed due to normal wear.

E. Failure mode, mechanism, and effect of each failed component, if known:

The failure of the chip on the CEA timer board was considered to be of a random nature as discussed in Section I.D. The CEAs are moved by upper and lower gripper assemblies. During movement, one gripper is energized and moves the CEA. Then the other gripper is energized to hold the CEA. When the chip on the CEA timer board failed, the voltage to the lower gripper was lost, allowing the CEA to slip out of position during the performance of the test to move the CEA.

The malfunction of the steam generator economizer valve positioner was due to normal wear. This allowed the valve positioner to cause the economizer valve to go fully open. When a close signal was sent, the worn o-rings allowed air to leak past the o-ring. The air leakage caused the valve to remain in the fully open position.

F. For failures of components with multiple functions, list of systems or secondary functions that were also affected:

Not applicable - no failure of components with multiple functions were involved.

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G. For a failure that rendered a train of a safety system inoperable, estimated time elapsed from the discovery of the failure until the train was returned to service:

Not applicable - no failures were involved which rendered a train of a safety system inoperable.

H. Method of discovery of each component or system failure or procedural error:

The failure of the timer board was discovered during troubleshooting by I & C personnel as discussed in Section I. B.

The malfunction of the steam generator economizer valve was

discovered by Control Room personnel (utility, licensed) when the valve failed open. The failed valve positioner was discovered following the event during routine troubleshooting and root cause of failure analysis. There were no procedural errors which contributed to this event.

I. Cause of Event:

The cause of the reactor trip and MSIS was due to high steam generator level on the number 1 Steam Generator. This high level was the result of the steam generator economizer valve failing full open (SALP Cause Code E: Component Failure).

The cause of the part-length CEA timer board failure is discussed in Section I.D. The cause of the steam generator economizer valve failure is discussed in Section I.D. No unusual characteristics of the work location (e.g., noise, heat, poor lighting) directly contributed to this event.

J. Safety System Response:

The Reactor Protective System (JC) functioned as designed with all four channels generating trip signals for "High Steam Generator Number 1 Level." This trip signal caused the reactor trip. The steam generator level trip was generated at 91 percent of narrow range as per design with a time response of 0.908 seconds which is within the Technical Specification requirement of less than 1.15 seconds.

An MSIS was also generated by the ESF actuation system in response to the event. The MSIS was generated at 91 percent of narrow range steam generator level. The main steam isolation valves (ISV)(SB), feedwater isolation valves (ISV)(SJ), downcomer isolation valves (ISV)(SJ), blowdown isolation valves (ISV)(AB),

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and sample isolation valves (ISV)(AB) actuated as per design with the exception of one steam generator sample valve which was inoperable prior to the event.

K. Failed Component Information: The steam generator economizer valve positioner is manufactured by Fisher. The manufacturer's model number is 3570.

The part-length CEA timer board is manufactured by Electromechanics, Inc., a division of Combustion Engineering. The manufacturer's part number is 38305.

II. ASSESSMENT OF THE SAFETY CONSEQUENCES AND IMPLICATIONS OF THIS EVENT:

A reactor trip and MSIS are the expected result of a high level in a steam generator. This event did not result in any challenges to the fission product barriers or result in any releases of radioactive material in excess of TS limits. During the post trip review, both events were analyzed and the safety consequences evaluated.

For a dropped or slipped CEA, the event is addressed in the Updated Final Safety Analysis Report (UFSAR) Section 15.4.3, "Single Full-Length Control Element Assembly Drop". Cycle specific analysis was done for Unit 1 Cycle 3. The analysis has shown that no fuel damage would occur and that no reactor trip would be required for this event.

The malfunction of the steam generator economizer valve is classified as an increase in the heat removal by the secondary system. This event is addressed in the UFSAR Section 15.1.2, "Increase in Feedwater Flow". The malfunction of the steam generator economizer valve is bounded by the existing safety analysis.

The analysis performed determined that the equipment required to operate was available and functioned as designed. Therefore, this event is bounded by current Safety Analysis as covered by UFSAR Chapters 6 and 15 and no safety consequences or implications resulted from this event.

III. CORRECTIVE ACTION:

A. Immediate:

The part-length CEA timer card was replaced, successfully tested, and returned to service.

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The steam generator economizer valve positioner for the steam generator economizer valve was replaced, successfully tested, and returned to service.

B. Action to Prevent Recurrence:

The root cause of failure for the malfunctioning timer card is being trended and compared to other failures with the intent of finding a commonality among the failures and determining a suitable resolution.

The root cause of failure analysis of the steam generator economizer valve positioner was performed by APS Engineering personnel, as discussed in Section I.D. Additional corrective actions are currently under evaluation by APS Engineering personnel. The expected completion of this evaluation is December 24, 1991.

IV. PREVIOUS SIMILAR EVENTS:

There have been no previous similar events reported pursuant to 10CFR50.73.

V. ADDITIONAL INFORMATION:

Based on the Incident Investigation Team review, unit restart was authorized by the Plant Manager in accordance with approved procedures. Unit 1 entered Mode 2 (STARTUP) at 0233 MST on September 24, 1991, and was placed back on the grid at 1257 MST on September 24, 1991.

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Arizona Public Service Company
PALO VERDE NUCLEAR GENERATING STATION
P.O. BOX 52034 o PHOENIX, ARIZONA 85072-2034

JAMES M. LEVINE 192-00749-JML/TRB/WH
VICE PRESIDENT October 14, 1991
NUCLEAR PRODUCTION

U. S. Nuclear Regulatory Commission
Attention: Document Control Desk
Mail Station P1-37
Washington, D.C. 20555

Dear Sirs:

Subject: Palo Verde Nuclear Generating Station (PVNGS)

Unit 1

Docket No. STN 50-528 (License No. NPF-41)

Licensee Event Report 91-009-00

File: 91-020-404

Attached please find Licensee Event Report (LER) 91-009-00 prepared and submitted pursuant to 10CFR50.73. In accordance with 10CFR50.73(d), we are forwarding a copy of the LER to the Regional Administrator of the Region V office.

If you have any questions, please contact D. Alan Johnson, Compliance Supervisor, at (602) 393-3703.

Very truly yours,

JML/TRB/WHD/nk

Attachment

cc: W. F. Conway (all with attachment)

J. B. Martin

D. H. Coe

INPO Records Center

*** END OF DOCUMENT ***
